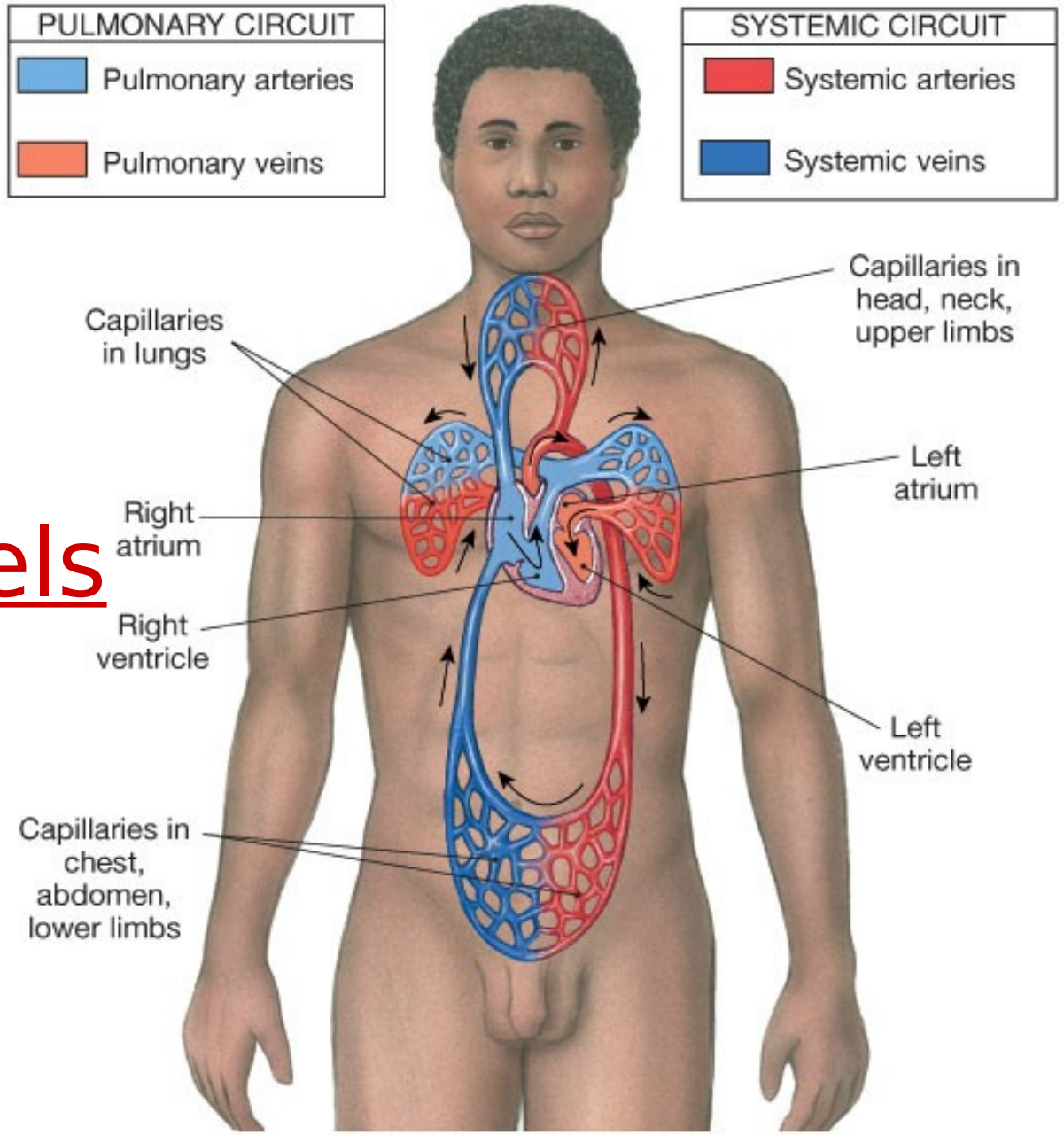
The Cardiovascular System

Heart

Central Pump

Blood Vessels

Transport Blood



Functions

- Transport around the body of:
  - O_2 from the lungs to body tissues
  - CO_2 from body tissues to lungs
  - Delivery of Nutrients to cells
  - Removal of Waste (+ toxins) from cells
  - Hormone circulation
  - Healing and repair of body tissues
- Thermoregulation

The Heart has 4 Chambers

The Atria – receive blood

The Ventricles – pump blood

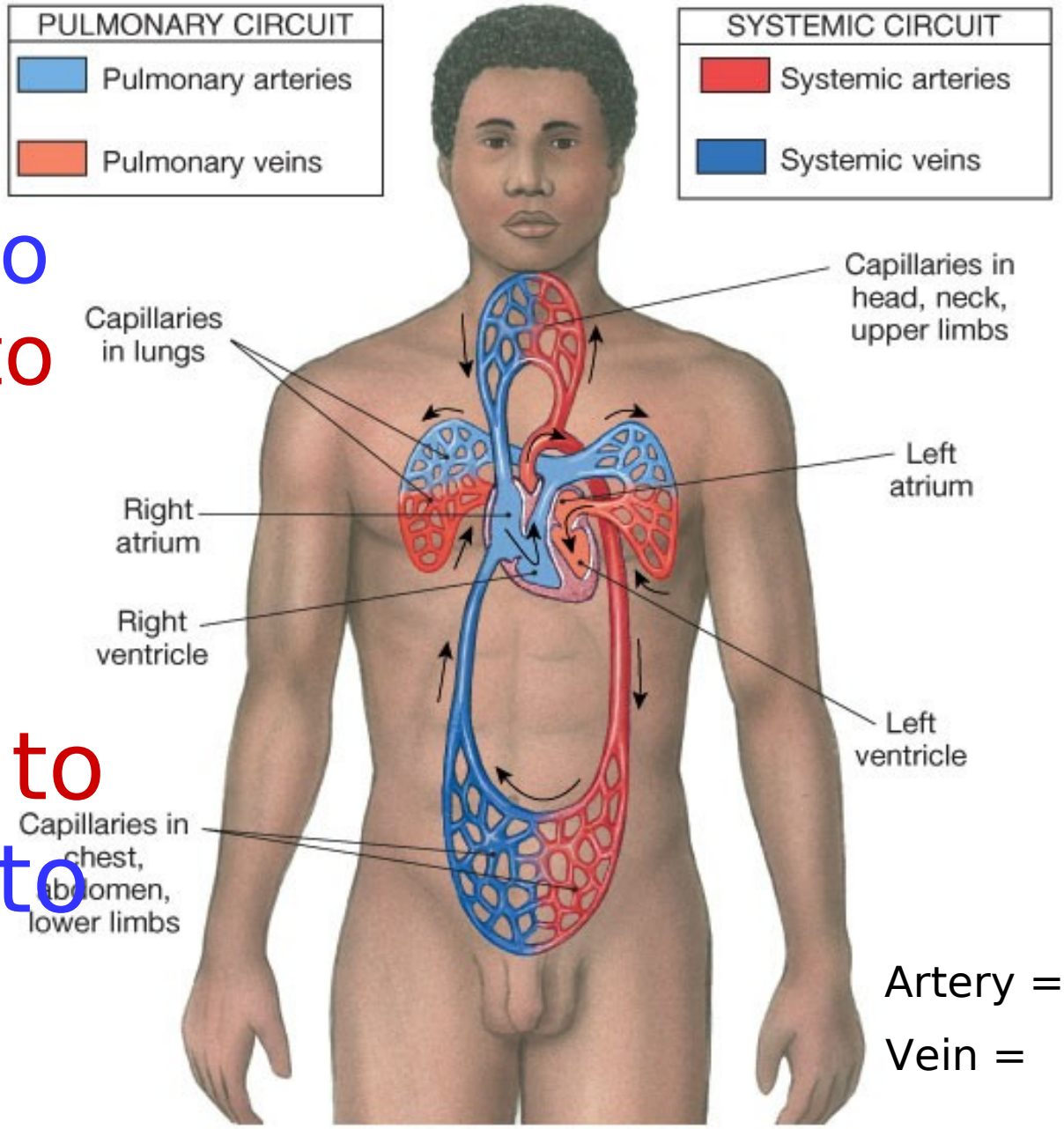
The 2 Circuits

Pulmonary Circuit

from heart to lungs back to heart

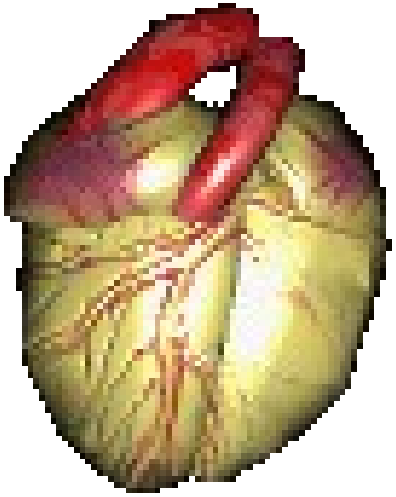
Systemic Circuit

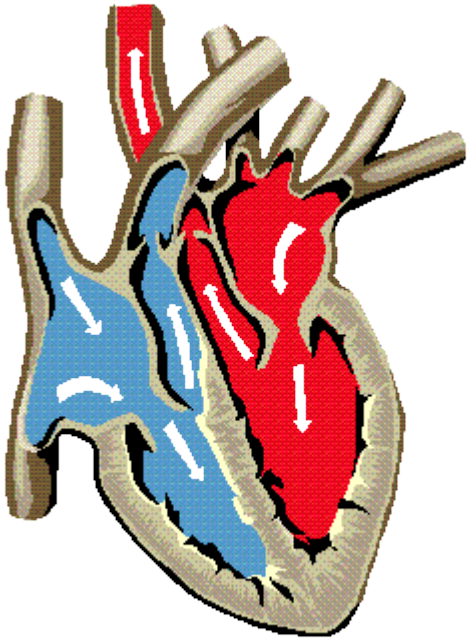
from heart to body back to heart



Artery =

Vein =





R Atrium – receives blood from body

(IVC, SVC).

Coronary sinus

R Ventricle – pumps blood to Lungs (PT).

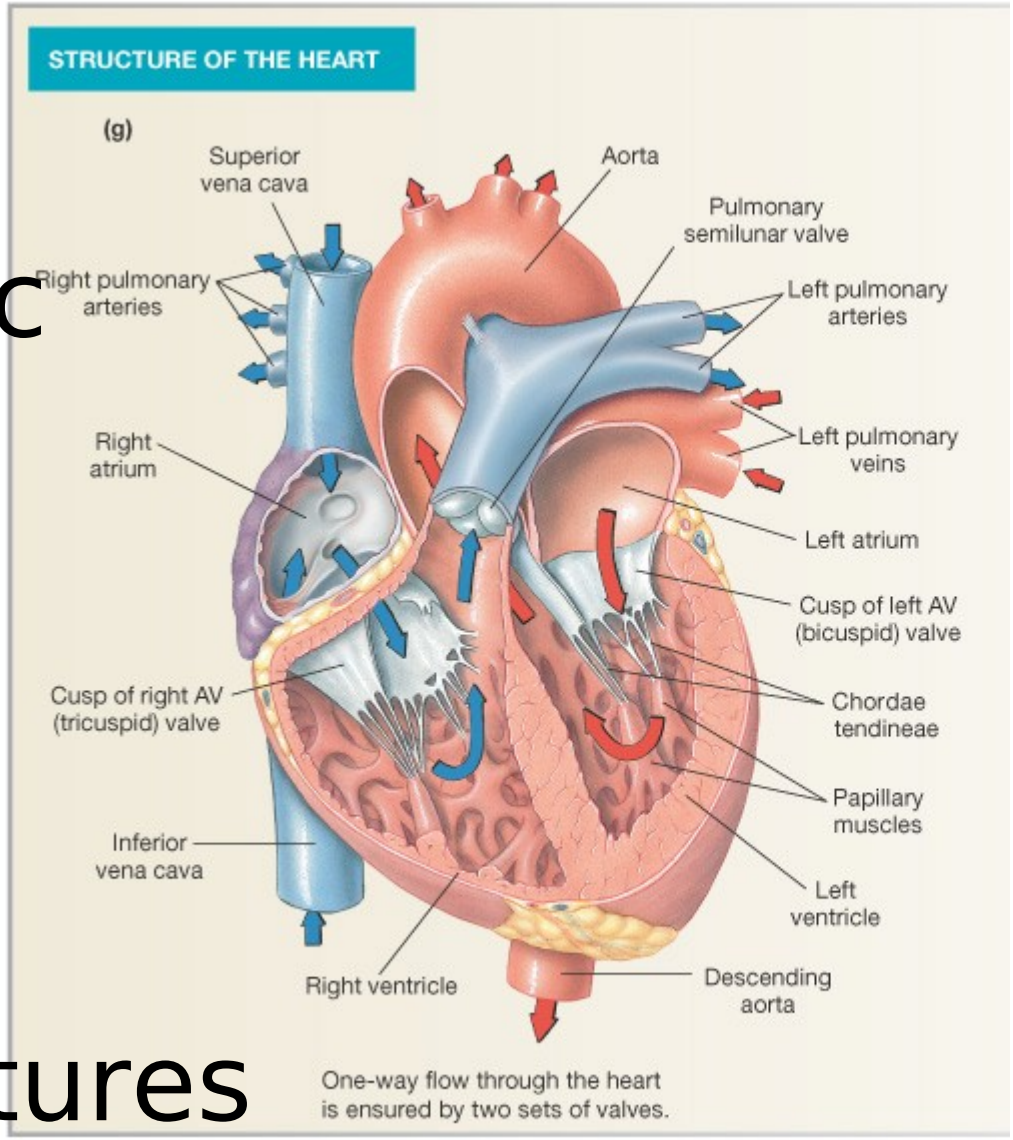
L Atrium – receives blood from lungs

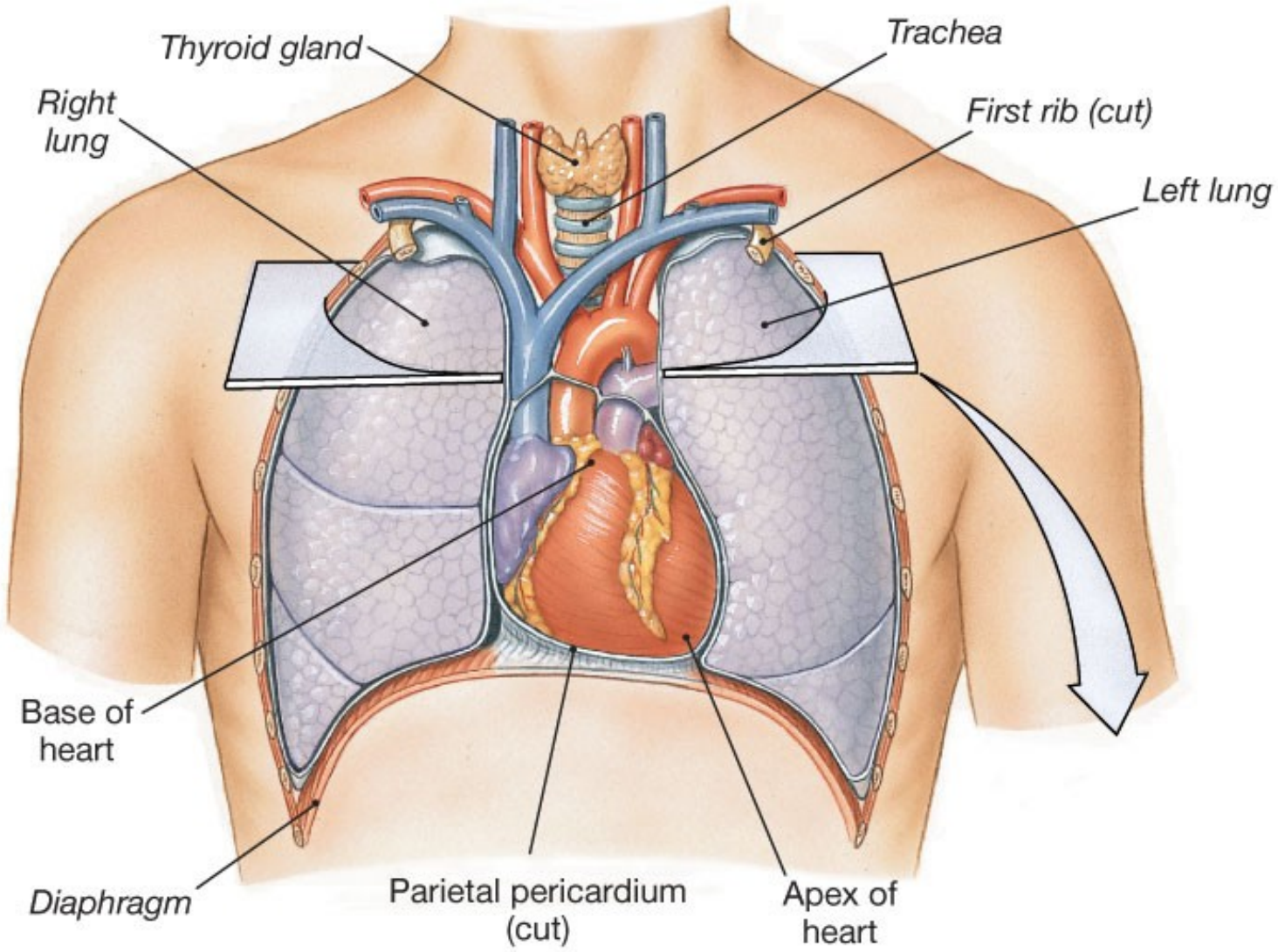
(L&R PV).

L Ventricle – pumps blood to Body

The Heart

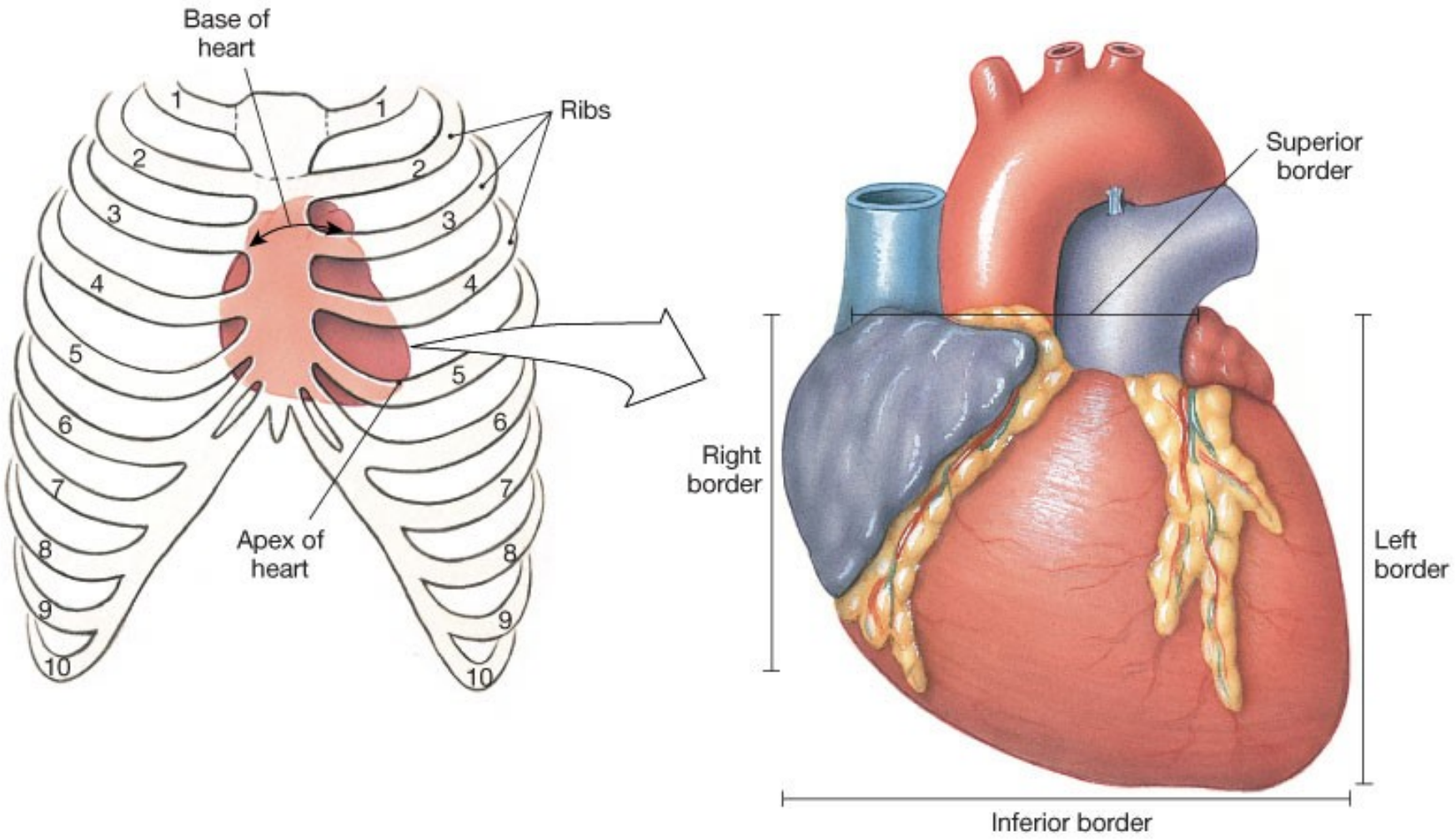
- Heart Tissue
- Pericardial Sac
- Fibroskeleton
- Valves
  (one-way-flow)
- Surface Structures



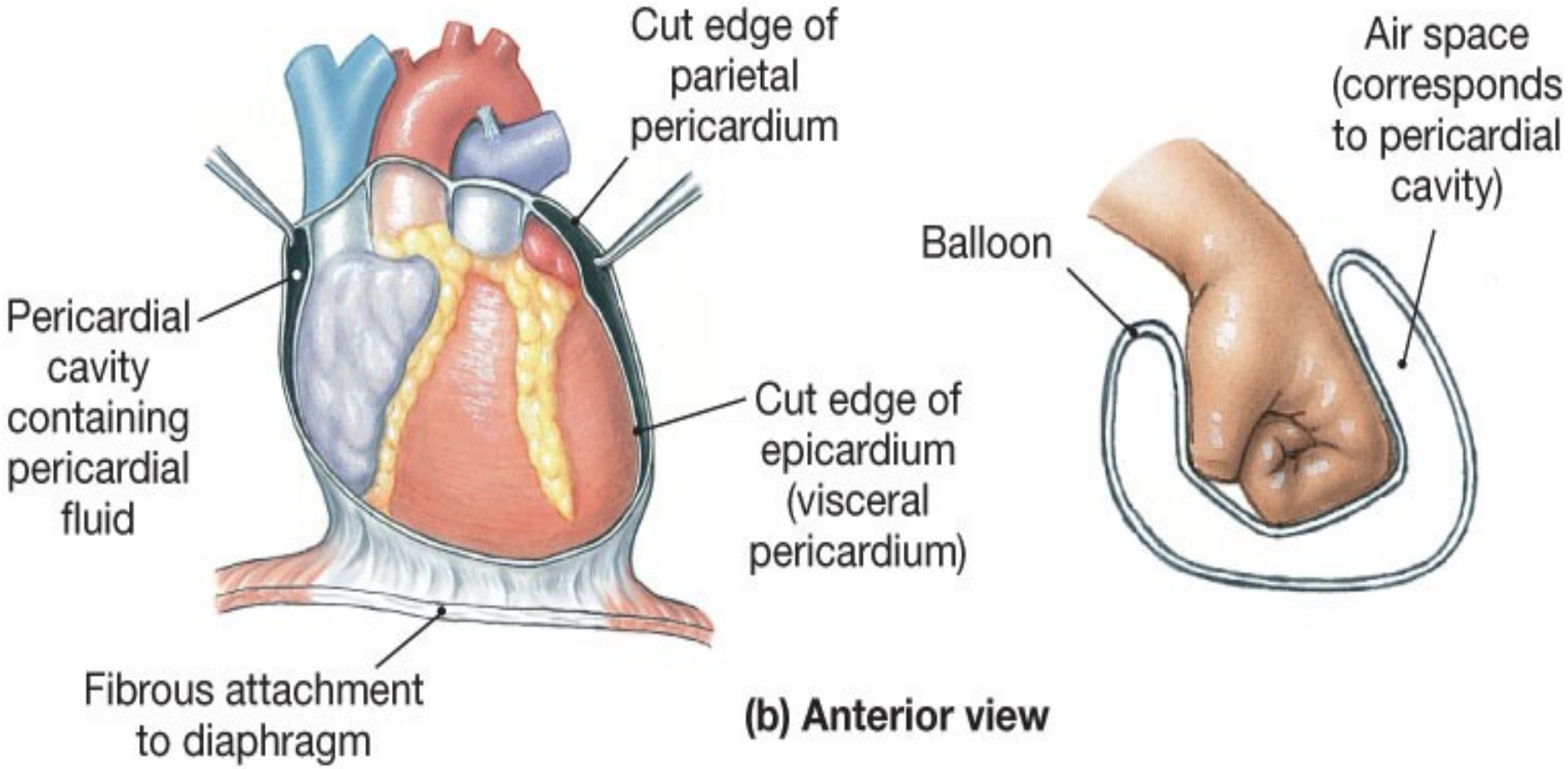


(a) Anterior view

Position and Orientation of the Heart



Pericardial Sac and Location of the Heart in the Thoracic Cavity


Cut edge of parietal pericardium
Pericardial cavity containing pericardial fluid
Cut edge of epicardium (visceral pericardium)
Fibrous attachment to diaphragm
(b) Anterior view
Air space (corresponds to pericardial cavity)
Balloon

Endocardium

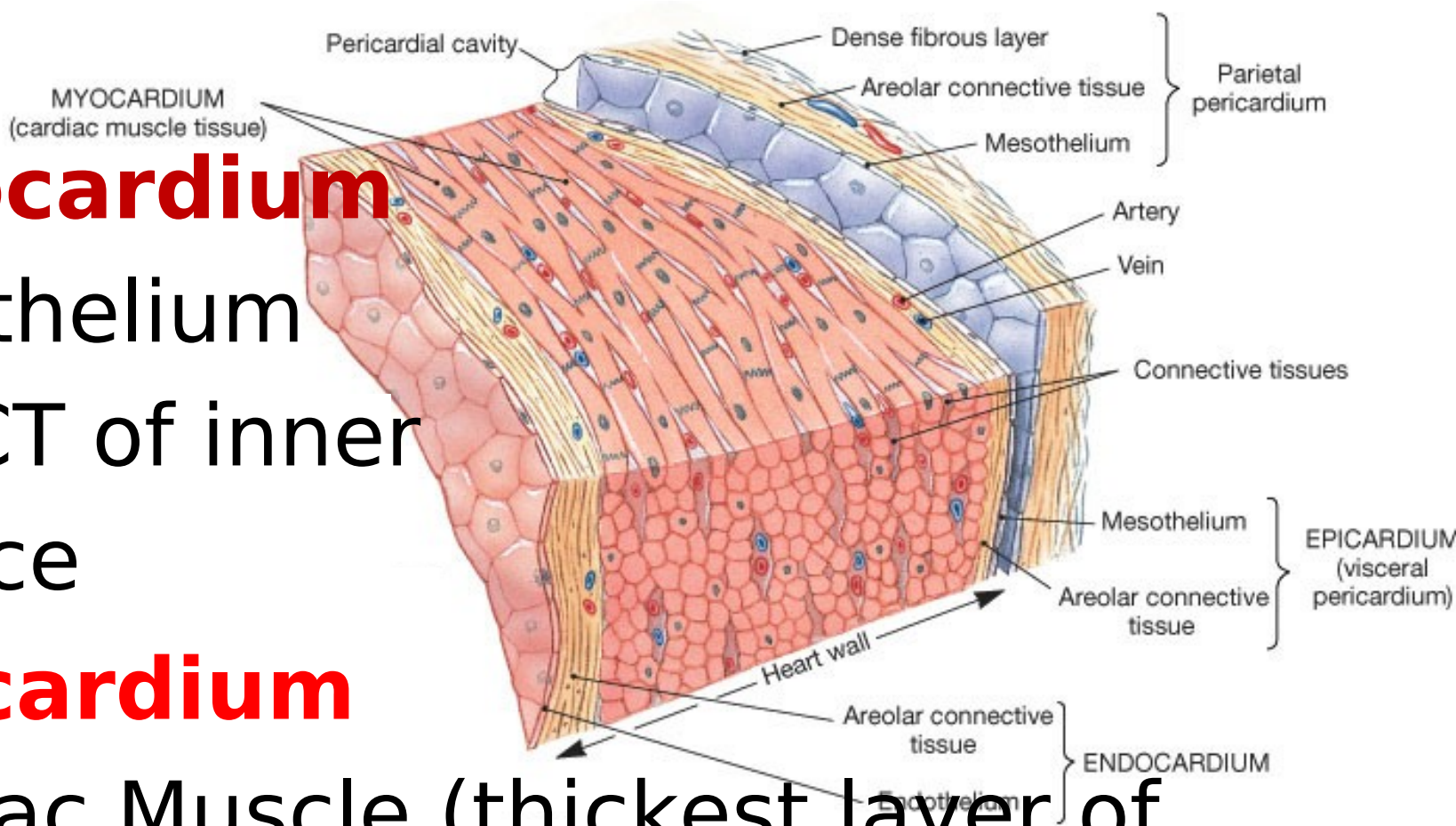
Endothelium and CT of inner surface

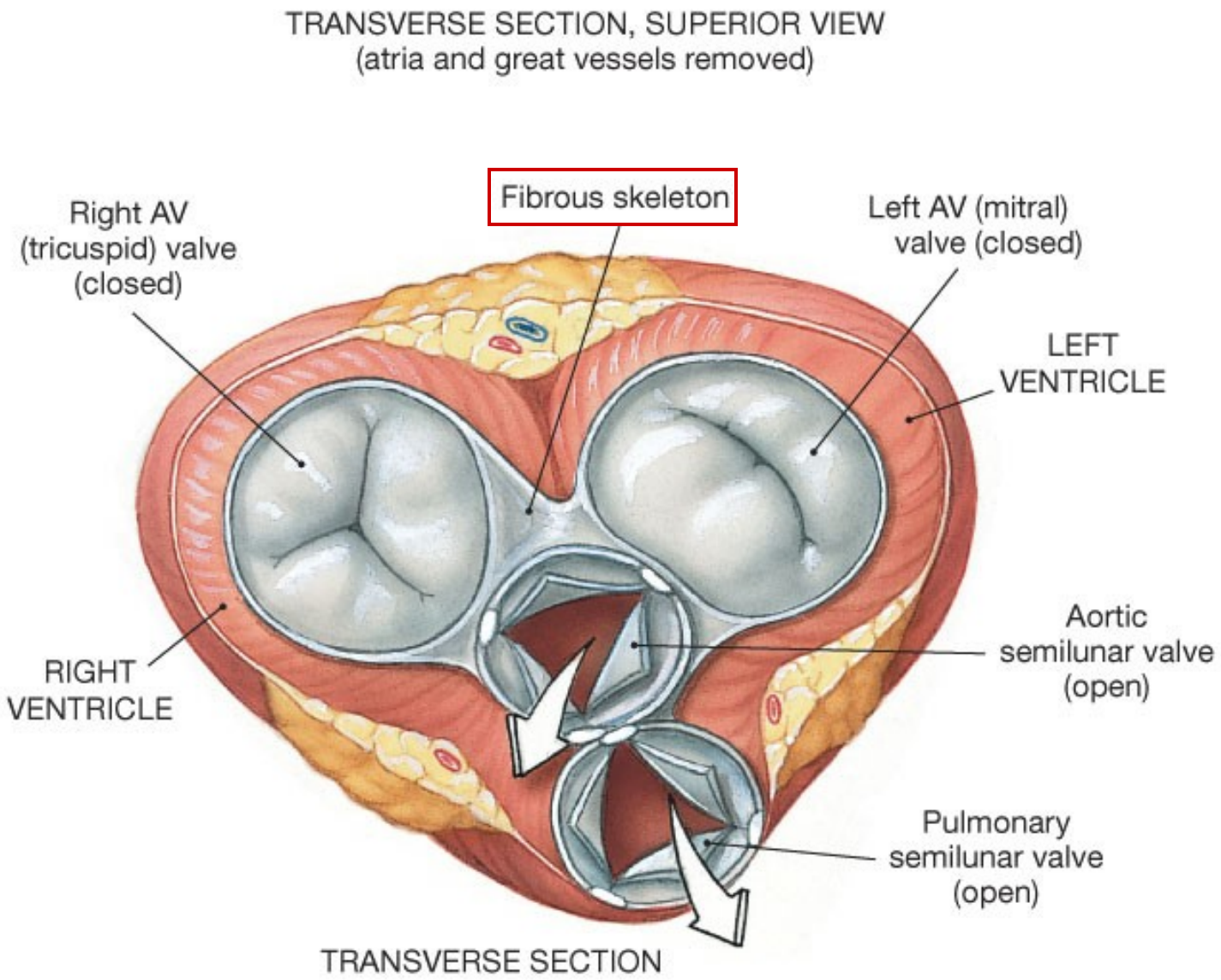
Myocardium

Cardiac Muscle (thickest layer of heart)

Epicardium

Visceral pericardium (a serous membrane)





Ventricular systole (contraction)

The Fibrous Skeleton

An internal connective tissue of the heart

1. Provides attachment for heart's valves

2. Evenly distributes the force of contraction

3. Electrically isolates atria from ventricles

Surface Anatomy of the Heart

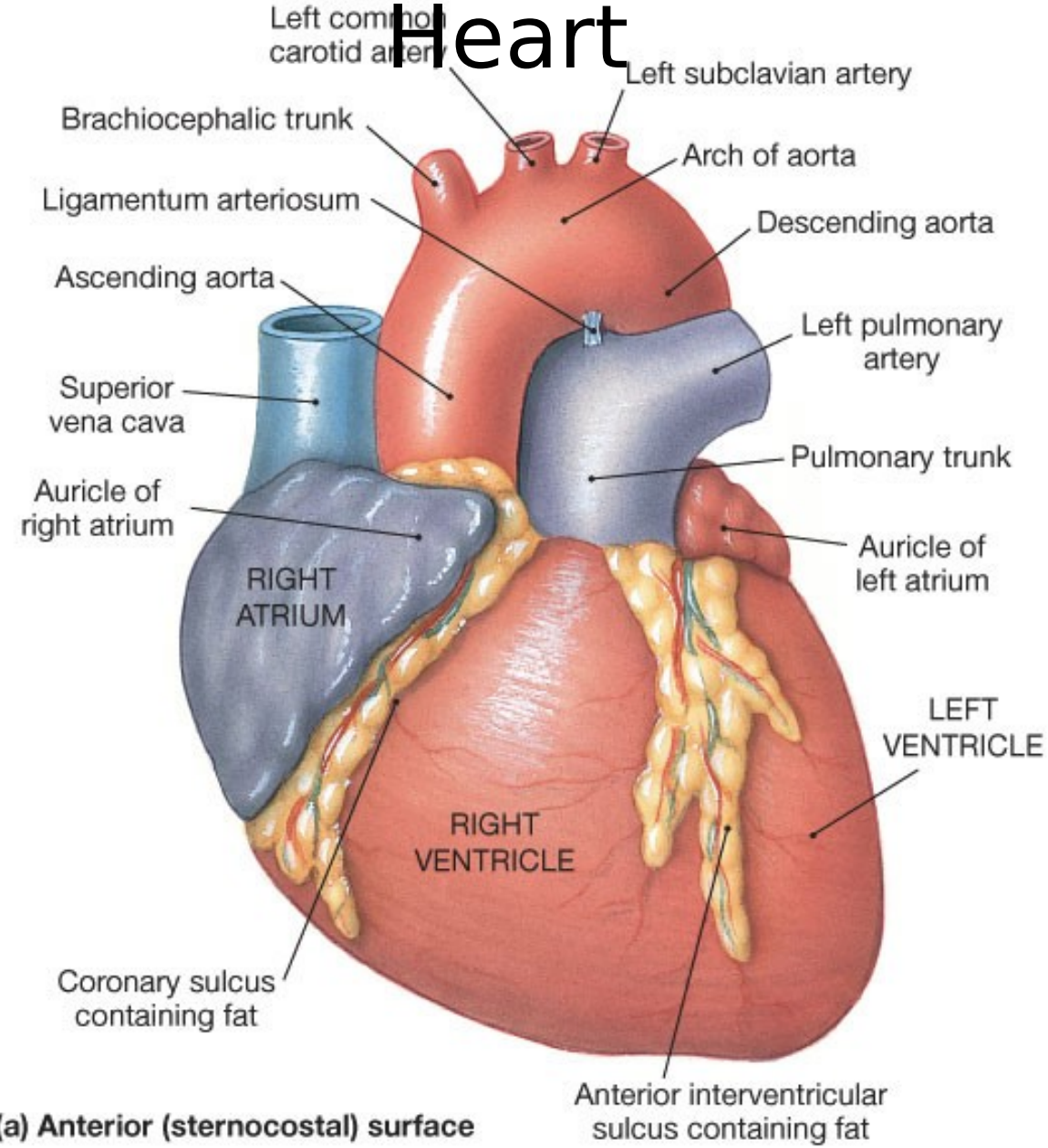
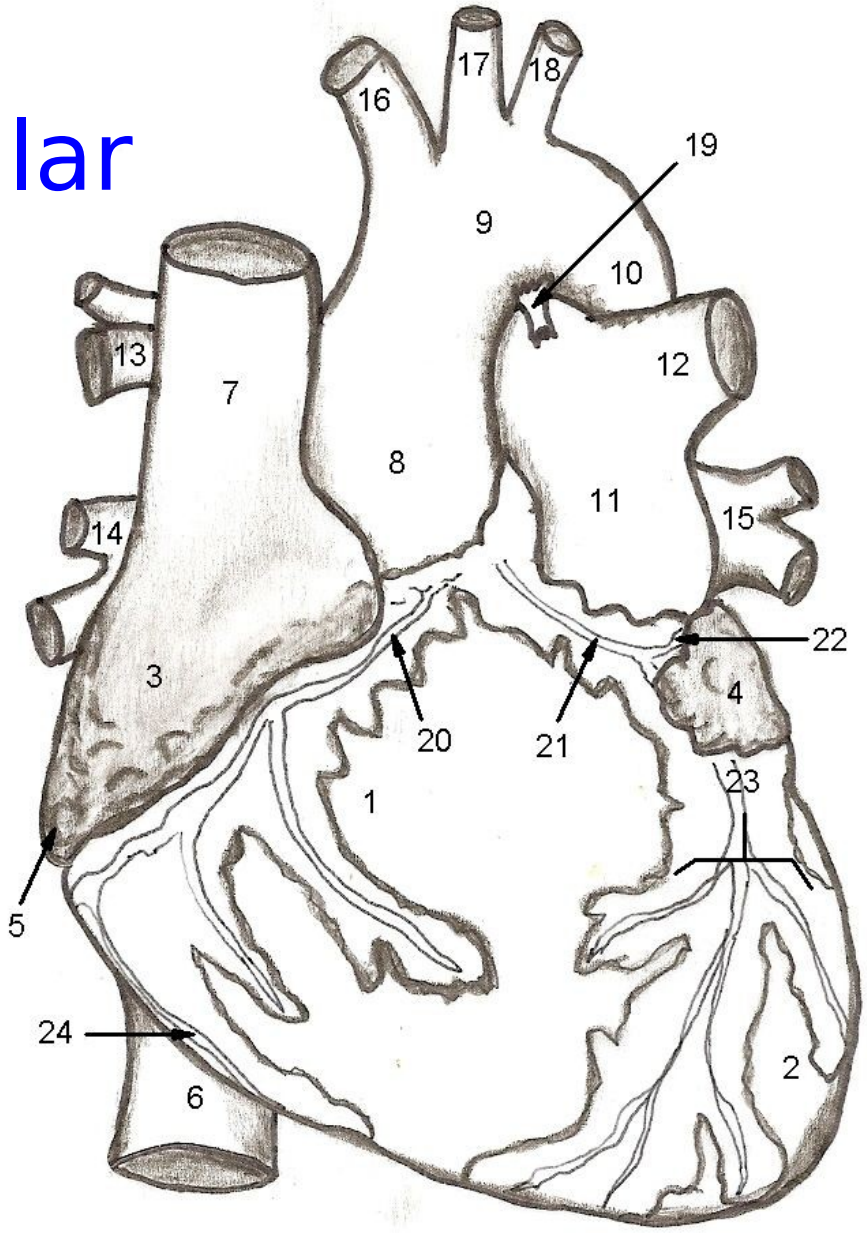
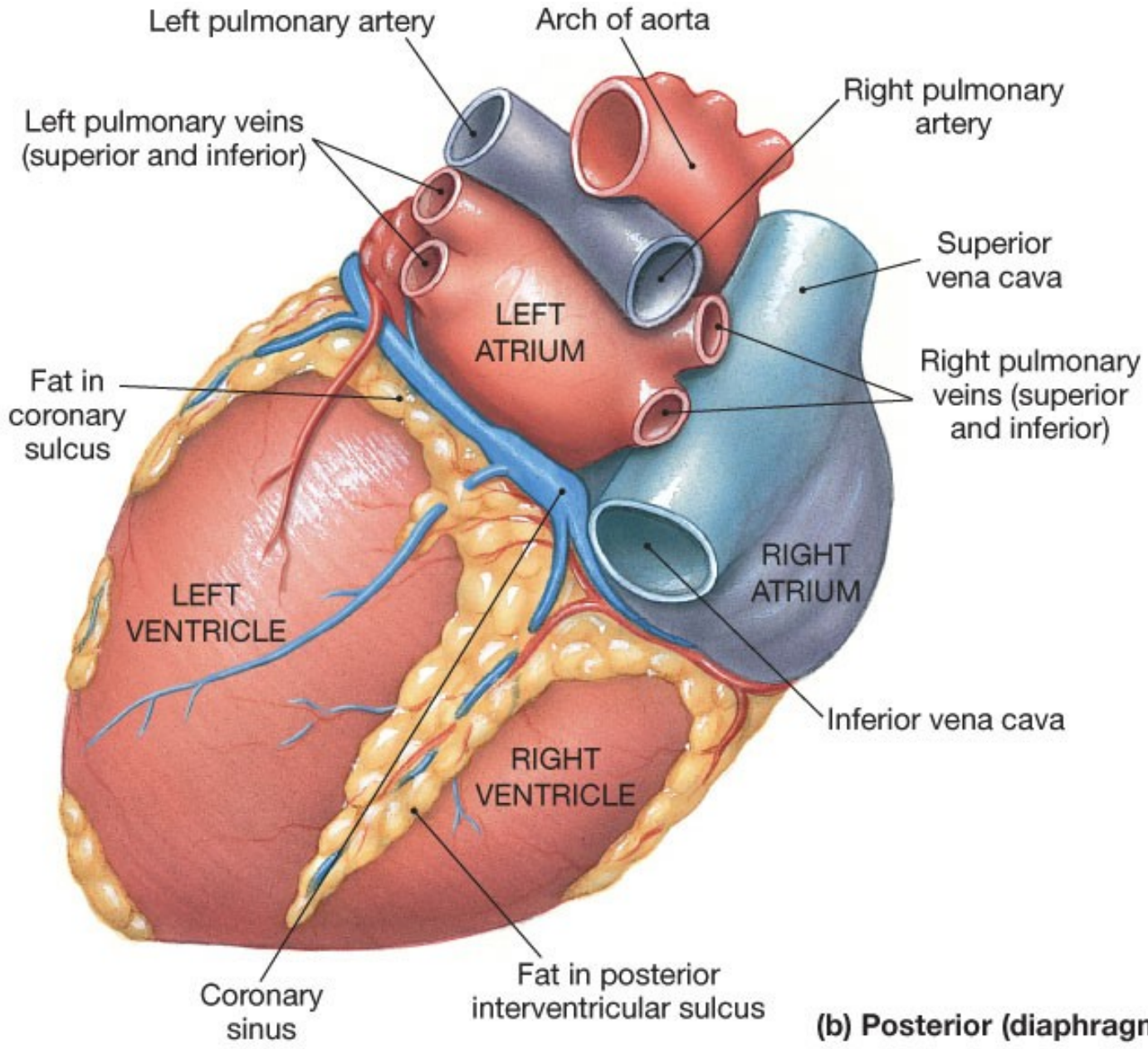


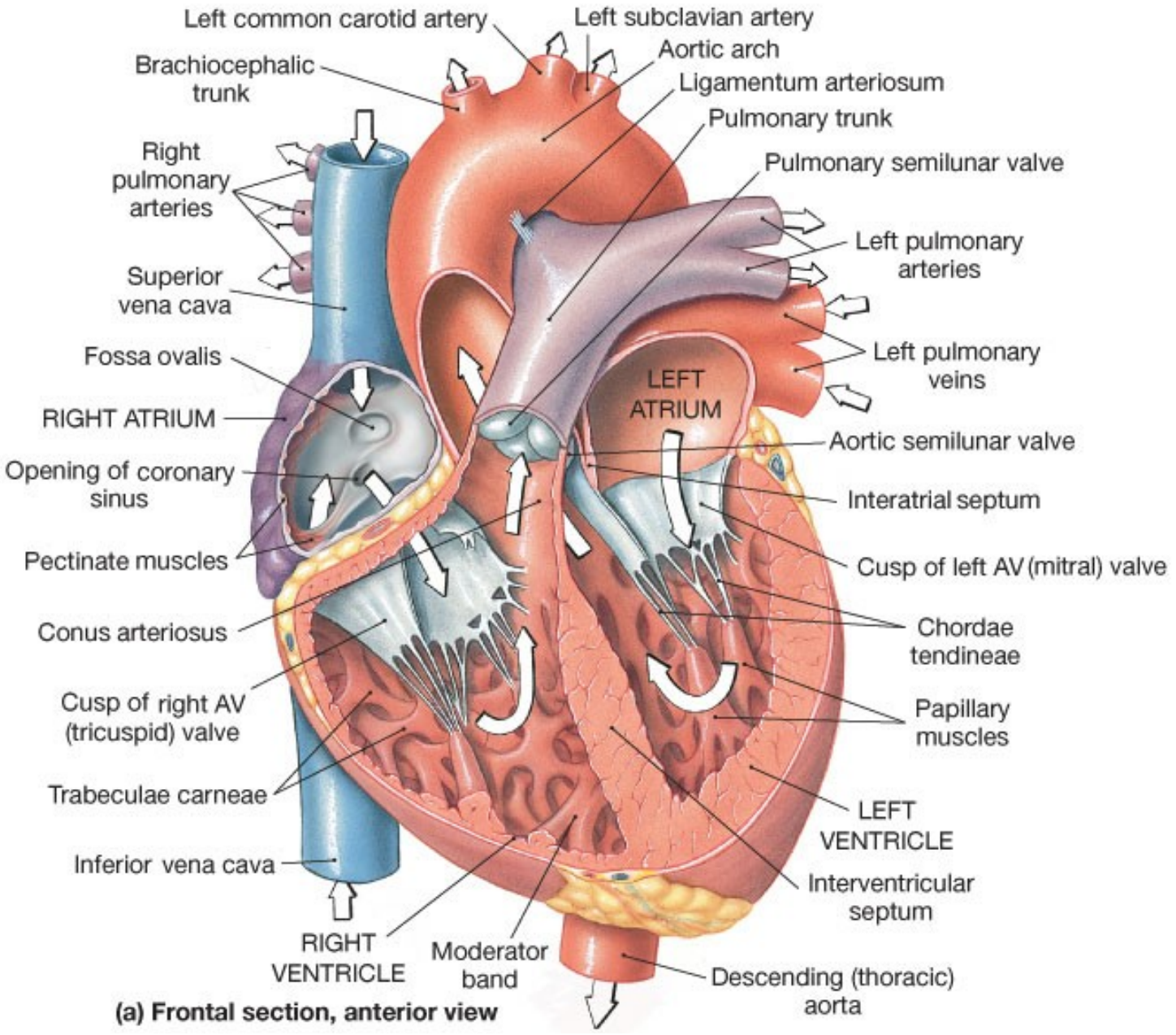
Image from Cardiovascular Worksheet



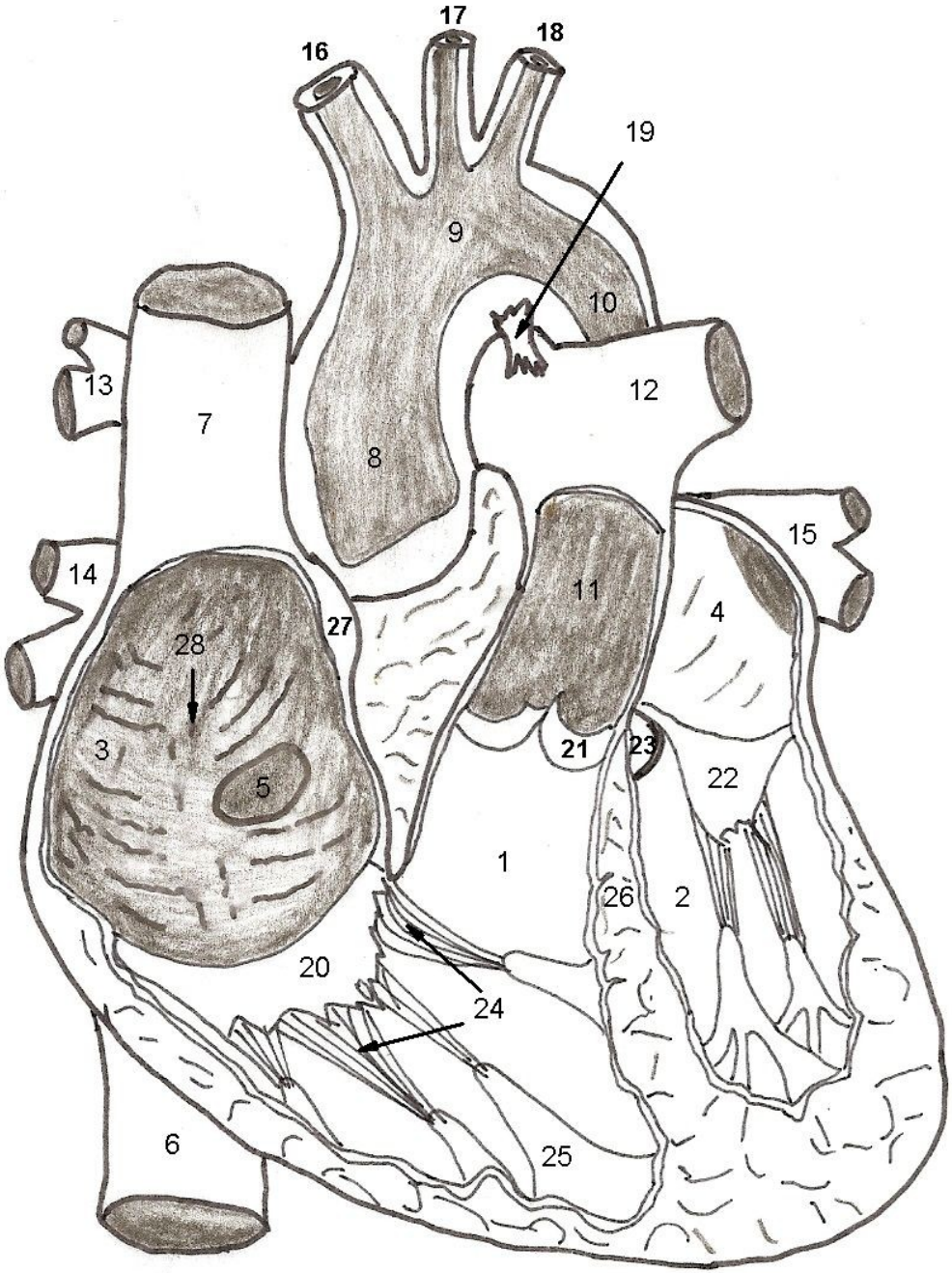


(b) Posterior (diaphragmatic) surface

Sectional Anatomy of the Heart



(a) Frontal section, anterior view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The Atria

- **<u>Right Atrium</u> receives blood from systemic circuit:**

  1) Superior vena cava

  2) Inferior vena cava

  3) Coronary Sinus

- **<u>Left Atrium</u> receives blood from pulmonary circuit:**

  From L and R Pulmonary veins.

- Walls of both Atria have Pectinate muscles.

- *Foramen ovale* open in utero – closes to become the *Fossa ovalis* after birth.

The Ventricles

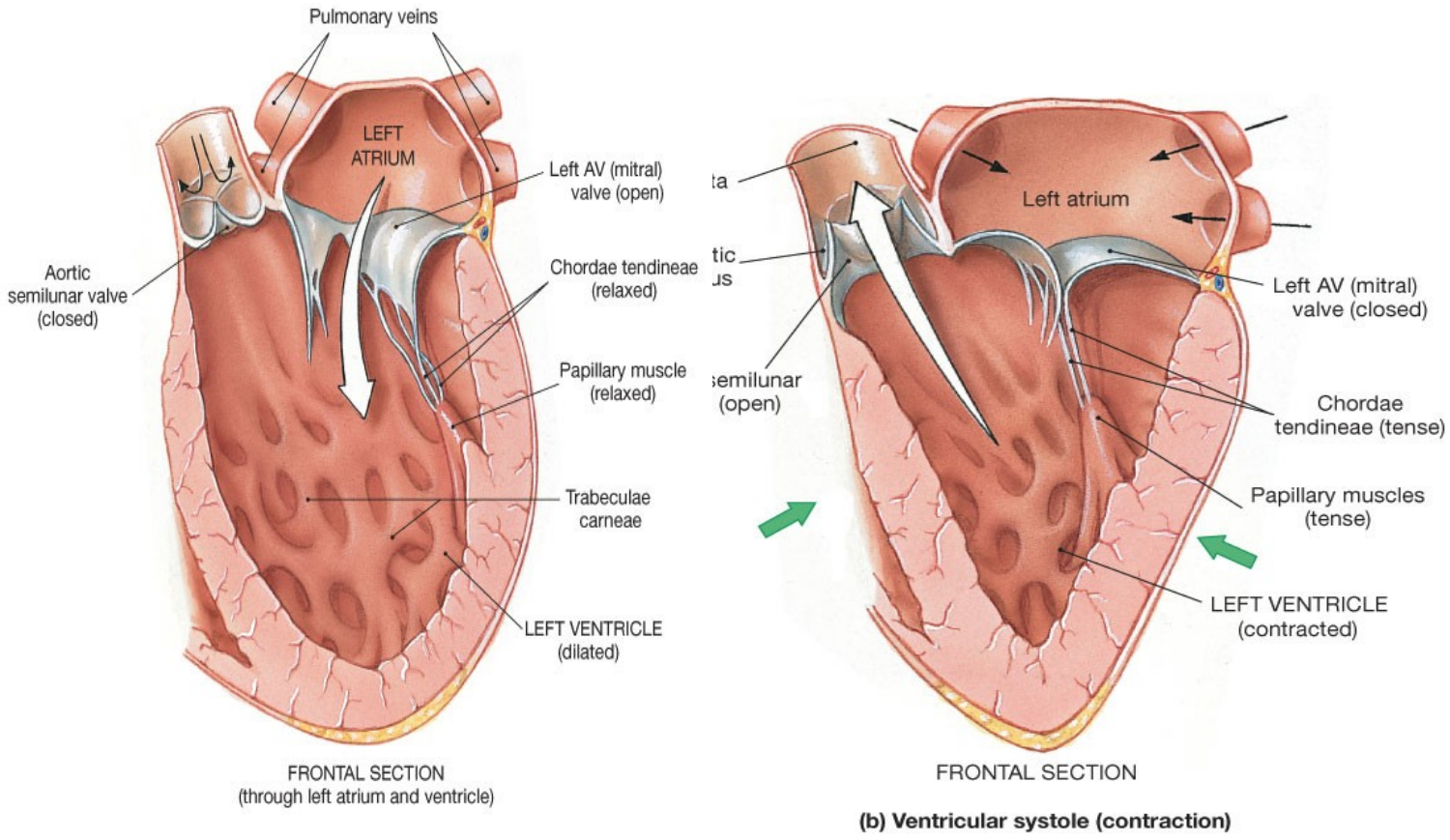
Blood from atria goes through (AV) valves:

- Tricuspid AV valve (Rt)
- Bicuspid AV valve (Lt)
  - Chordae Tendineae
  - Papillary Muscles
  - Trabeculae Carneae

Blood leaves via pulmonary trunk and aorta

- Pulmonary semilunar valve (Rt)
- Aortic semilunar valve (Lt)

Valves of the Heart



How do papillary muscles work?

Heart Valves and Heart Sounds

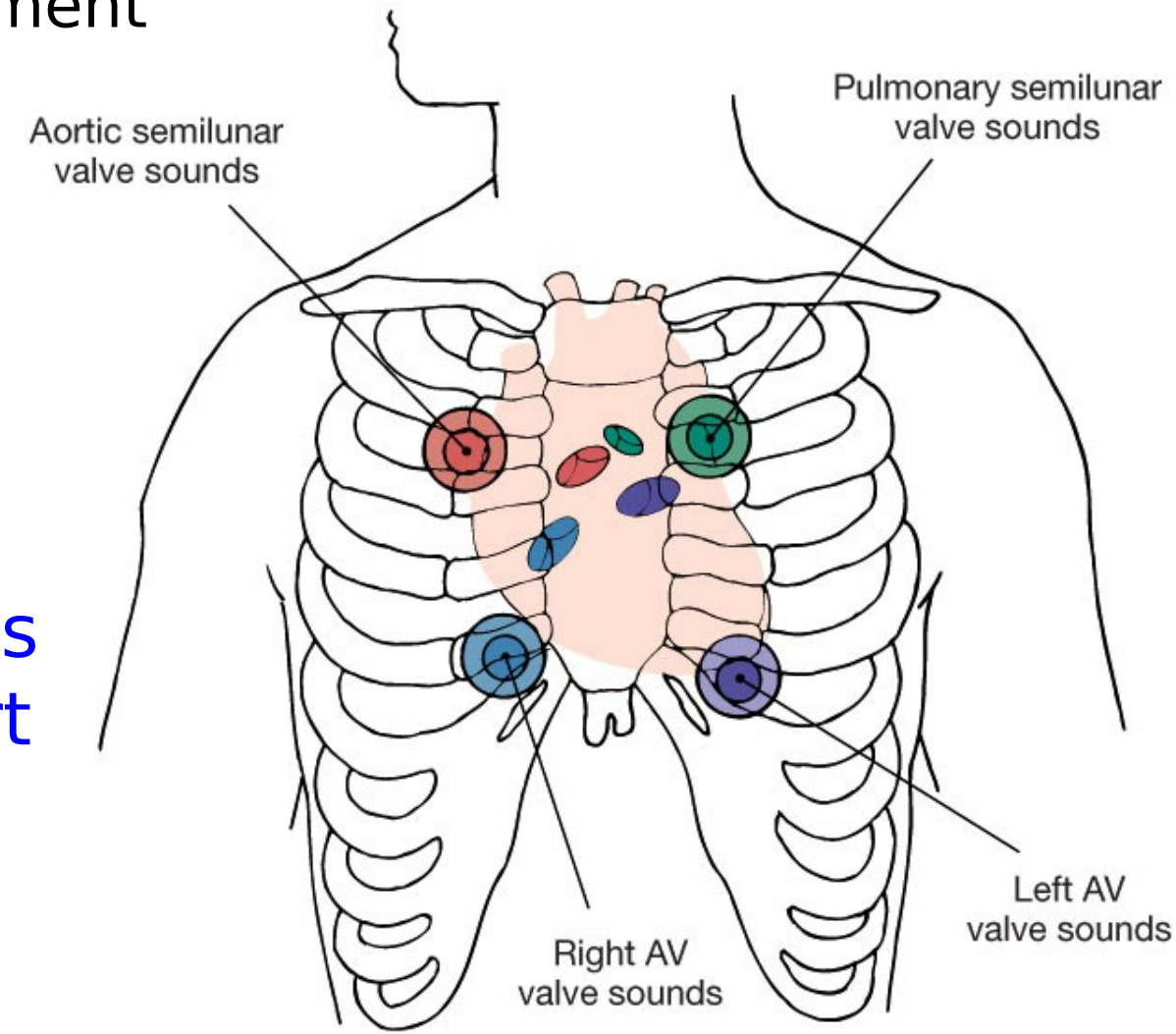
Stethoscope Placement

- Closure of AV valves creates 1st heart sound

  'Lub'

- Closure of semilunar valves creates 2nd heart sound

  'Dupp'



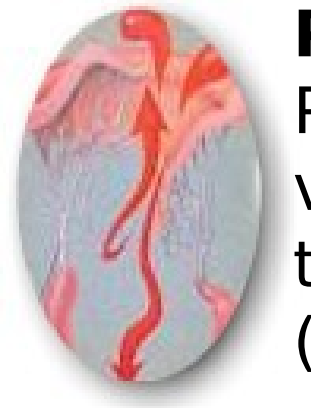
Disorders of Heart Valves

Normal Heart Valves

Problem Heart Valves

Problems Opening:
Stenosis – narrowing of valve, when a valve doesn't open completely.

Turbulence = noise = **murmur**.

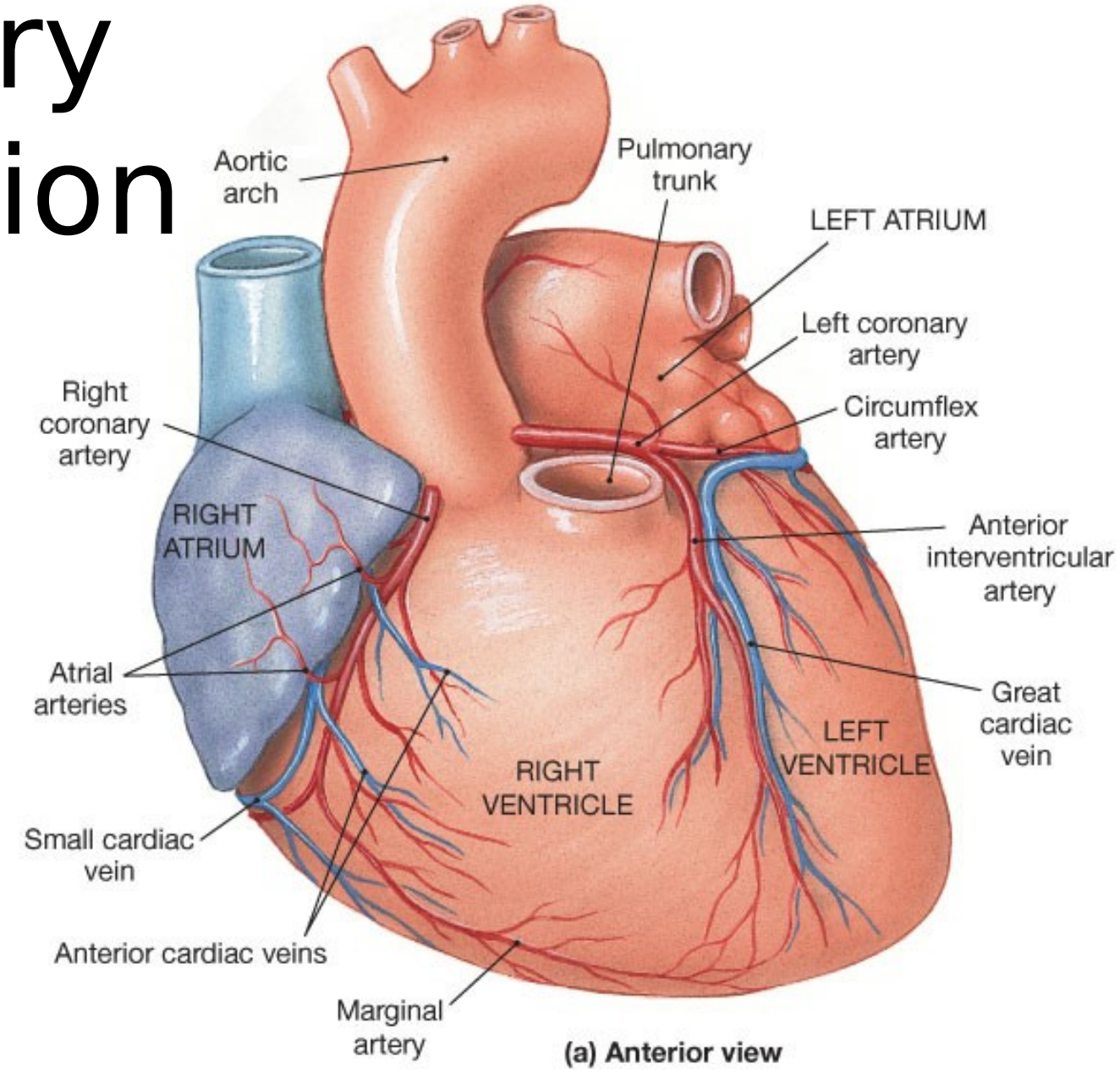


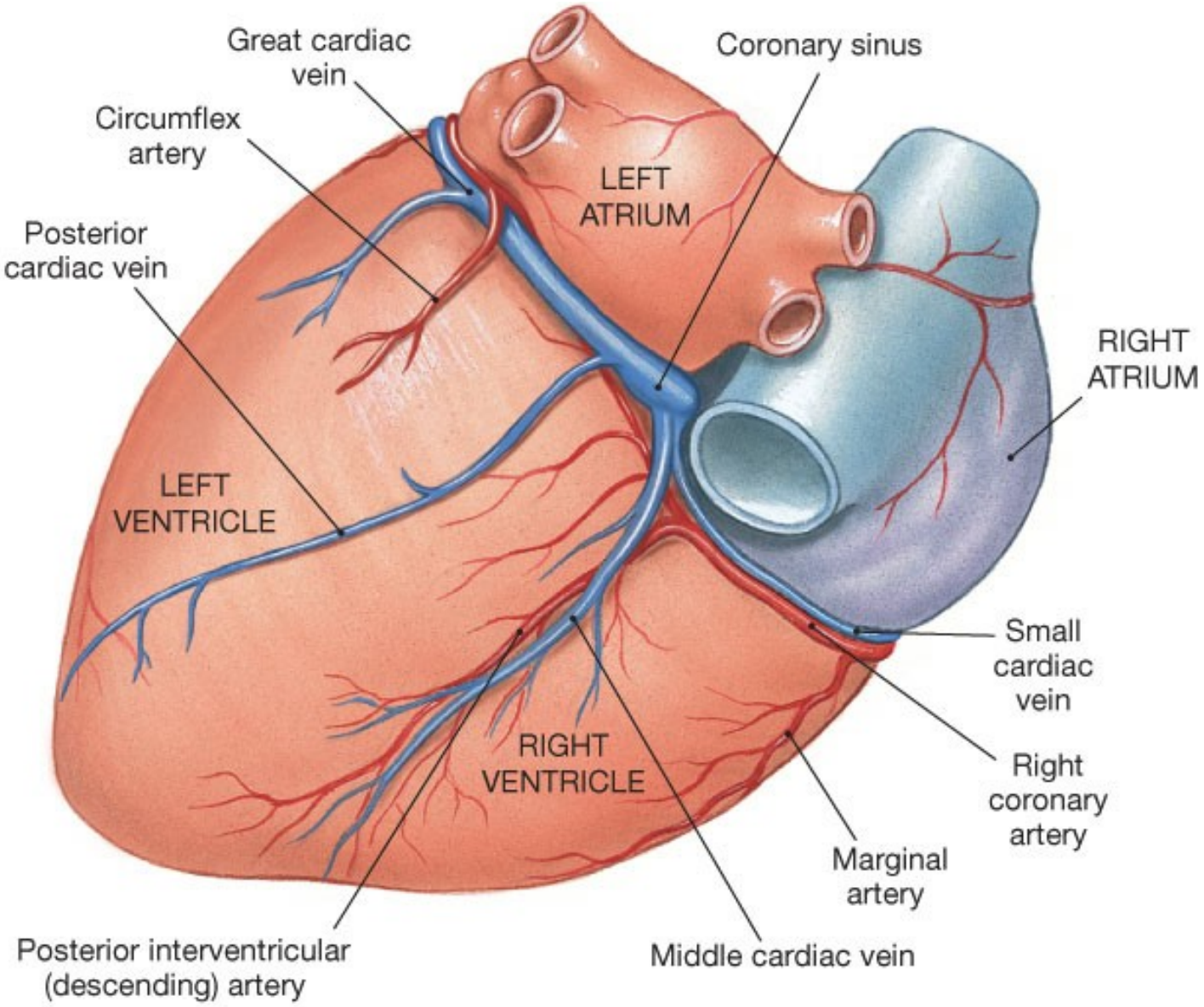
Problems Closing:
Prolapse – overlapping or when valve doesn't close tightly. Also termed valvular insufficiency (regurgitation)

Retrograde flow = noise = **murmu**

Coronary Circulation

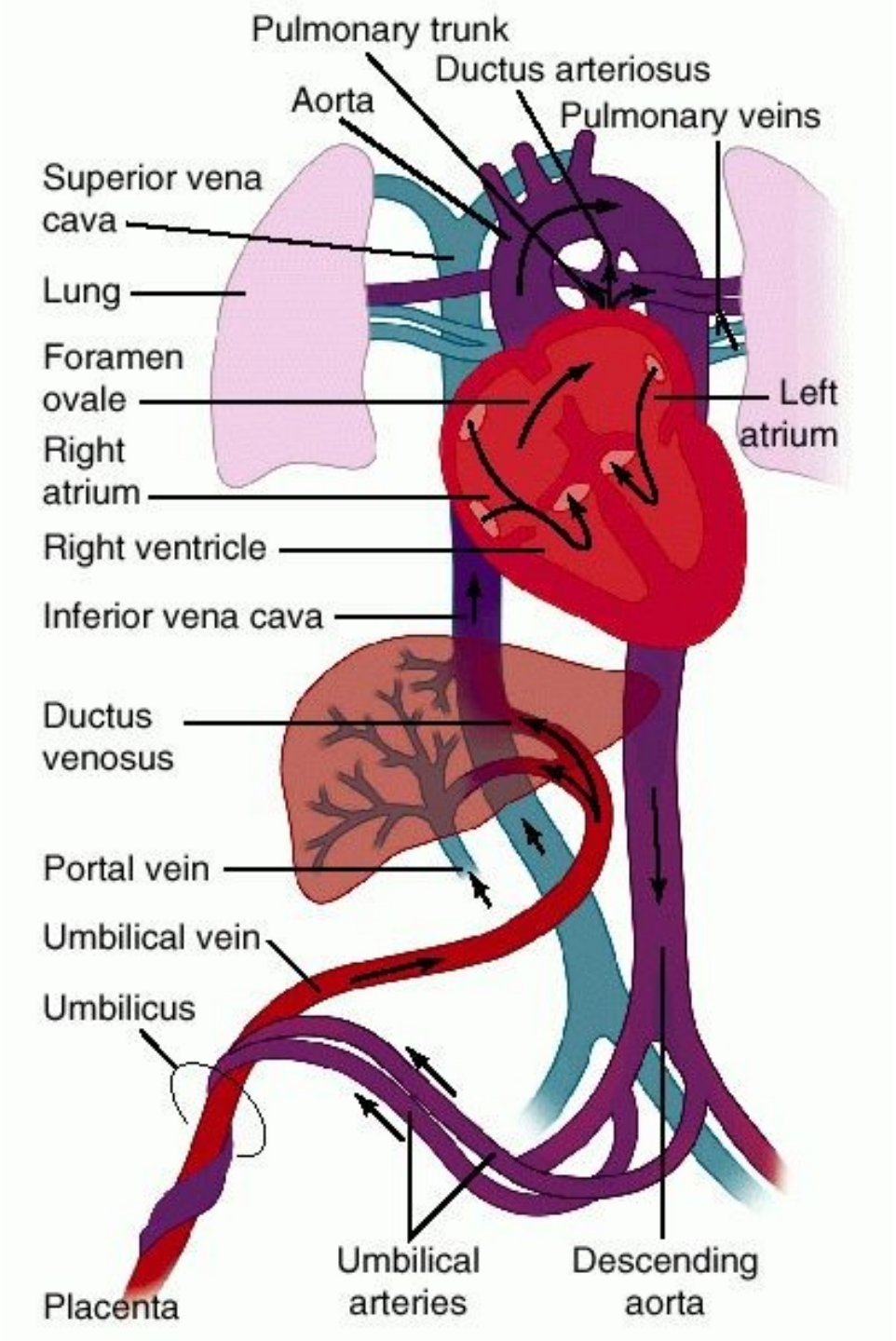
Blood Supply to the Heart!





(b) Posterior view

Fetal Circulation



Umbilical Vein

Umbilical Arteries

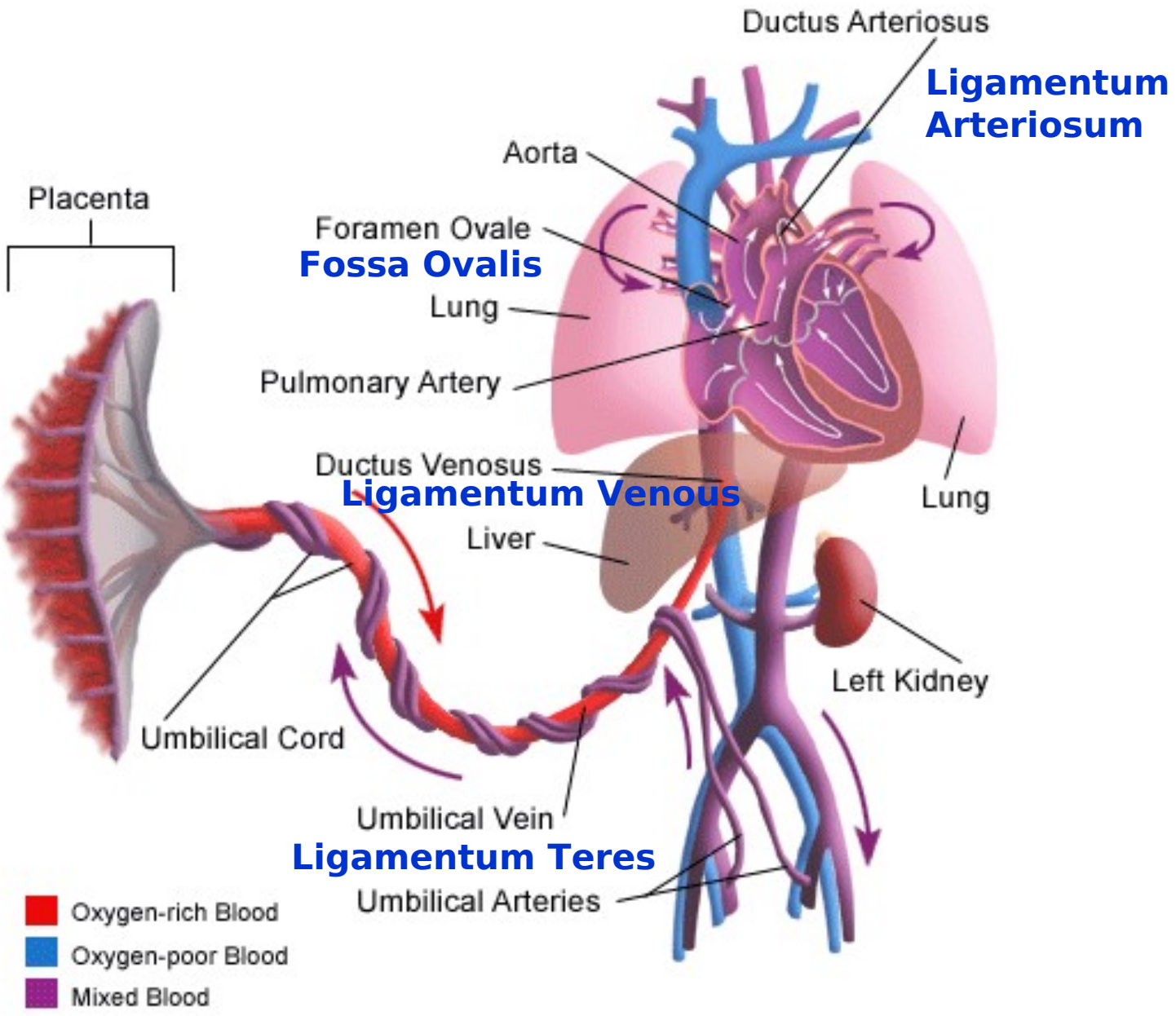
Changes in Heart After Birth

1. Foramen Ovale → Fossa Ovalis
2. Ductus Arteriosus → Ligamentum Arteriosum

Changes in Vessels After Birth

1. Ductus Venosus → Ligamentum Venosum
2. Umbilical Vein → Ligamentum Teres

Fetal Circulation



Control of the Heart

- Basic rate established by pacemaker cells inside heart (myocardium)

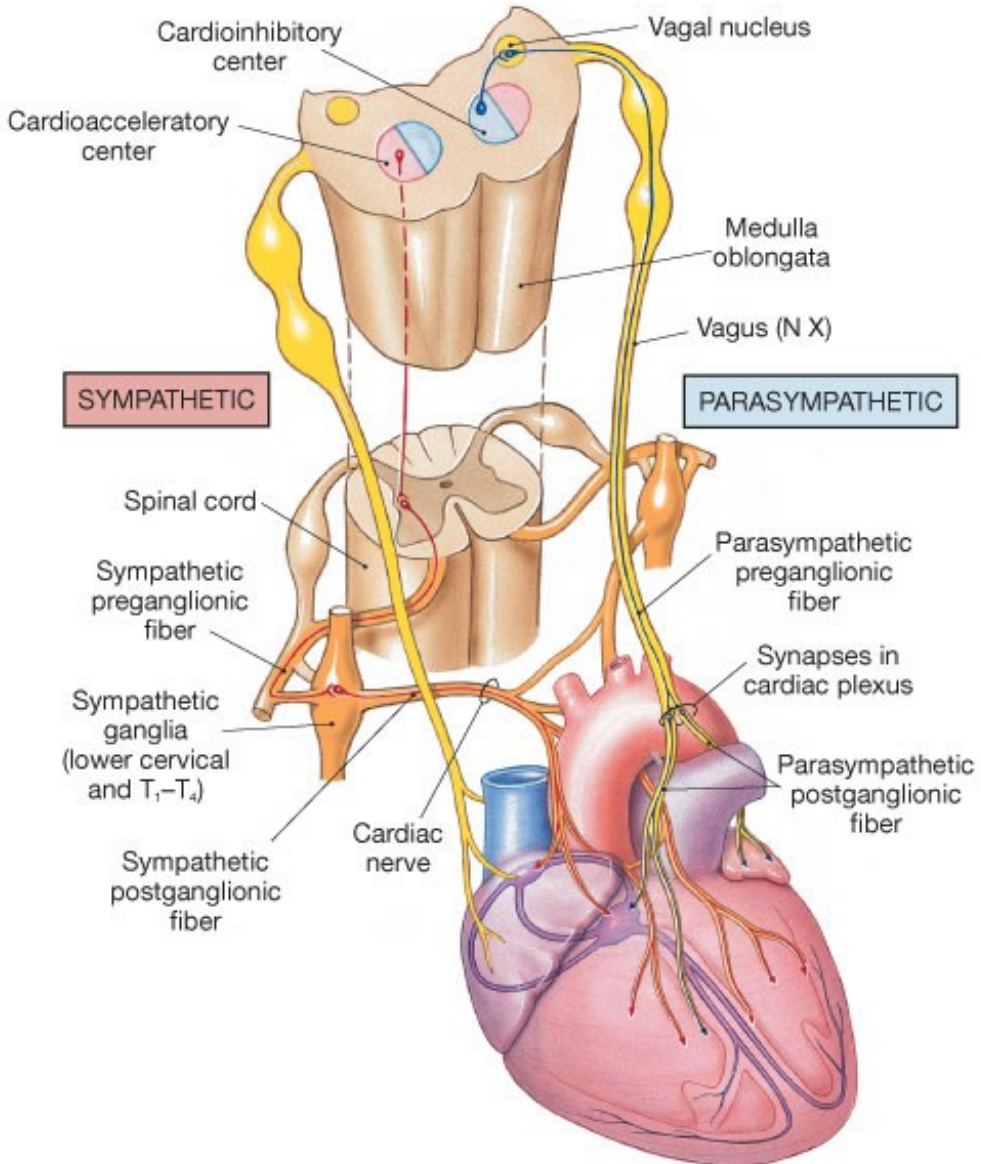
"***intrinsic myogenic control***"

- Modified by Autonomic N.S. (**ANS**)

Para: decreases rate via Vagus n. X

Sym: increases heart rate and force of contraction via cardiac accelerator n.

The Autonomic Innervation of the Heart



Cardiac Centers in CNS

- Cardioaccelatory center
  - M.O. activates Sympathetic neurons.
- Cardioinhibitory center
  - M. O. activates Parasympathetic neurons.

Centers receive input from

- Higher centers (cerebrum).
- Receptors monitoring blood pressure.
- Receptors monitoring dissolved gases.